What is claimed is:

1. A friction agitation welding method of forming a weld across a joint between superposed plate workpieces disposed and grasped between a rotatably driven friction agitation welding tool and a back-up tool which are opposed to each other in a predetermined axis of welding, said friction agitation welding method comprising the steps of:

preparing superposed plate workpieces comprising a first plate workpiece made up of one or more plates and a second plate workpiece made up of a single plate having a joint bore formed therein,

disposing and grasping said superposed plate workpieces between said rotatably driven friction agitation welding tool and said back-up tool with said joint bore being faced to said back-up tool;

rotating and advancing said friction agitation welding tool toward said back-up tool in said predetermined axis of welding to cause said friction agitation welding tool to penetrate into said first plate wirkpiece while urging said friction agitation welding tool and said first plate workpiece together whereby generating frictional heat to create a plasticized region in a workpiece material around said friction agitation welding tool and cramming a plasticized workpiece material into said joint bore of said second plate workpiece; and

allowing said plasticized workpiece material to solidify to complete a weld across said joint.

2. A friction agitation welding method as defined in claim 1, wherein said plasticized workpiece material is partly extruded out of said joint bore so as to spread out of said joint bore.

3. A friction agitation welding method as defined in claim 1, wherein, while urging said friction agitation welding tool and said first plate workpiece together, pressure is applied to said second plate workpiece in a region around said joint bore from the outside and is relieved from said first plate workpiece in a corresponding region.

4. A friction agitation welding method as defined in claim 1, wherein said first plate workpiece is different in material from and lower in hardness than said second plate workpiece.

5. A friction agitation welding method as defined in claim 4, wherein said first plate workpiece is made up of at least one aluminum plate and said second plate workpiece is made up of a single steel plate.

6. A friction agitation welding method as defined in claim 4, wherein said first and second plate workpieces are made of a same material.

7. A friction agitation welding device for forming a weld across a joint between superposed plate workpieces that comprise a first plate workpiece made up of one or more plates

and a second plate workpiece made up of a single plate having a joint bore formed therein, said friction agitation welding device comprising:

a rotatably driven friction agitation welding tool adapted to penetrate a joint between said superposed plate workpieces from said first plate workpiece as to plasticize a material of said plate workpieces with frictional heat generated resulting from rotation of said rotatably driven friction agitation welding tool; and

a back-up tool aligned with said rotatably driven friction welding tool in an axis of welding and supporting said superposed plate workpieces from a side of said second plate workpiece, said back-up tool having a top cavity whose opening diameter is greater than a diameter of said joint bore of said second plate workpiece.

8. A friction agitation welding device as defined in claim 7, wherein said rotatably driven friction agitation welding tool comprises a cylindrical shank and a cylindrical friction agitation spindle extending from said shank and having a diameter smaller than said shank.

9. A friction agitation welding device as defined in claim 8, wherein said shank has an annular groove formed in said shank coaxially with and around said cylindrical friction agitation spindle.

10. A friction agitation welding device as defined in claim 7, wherein said back-up tool is provided with an annular wall surrounding said top cavity.